

**IT IS THE VENDOR'S RESPONSIBILITY TO
CHECK FOR ADDENDA PRIOR TO SUBMITTING PROPOSALS**

**NOTICE TO BIDDERS
SPECIFICATION NO. 04-083**

The City of Lincoln, Nebraska intends to purchase and invites you to submit a sealed bid for:

Microwave Fluid Density Meter

Sealed bids will be received by the City of Lincoln, Nebraska on or before 12:00 noon Wednesday, March 24, 2004 in the office of the Purchasing Agent, Suite 200, K Street Complex, Southwest Wing, 440 South 8th Street, Lincoln, Nebraska 68508. Bids will be publicly opened and read at the K Street Complex.

Bidders should take caution if U.S. mail or mail delivery services are used for the submission of bids. Mailing should be made in sufficient time for bids to arrive in the Purchasing Division, prior to the time and date specified above.

PROPOSAL
SPECIFICATION NO. 04-083
BID OPENING TIME: 12:00 NOON
DATE: Wednesday, March 24, 2004

The undersigned, having full knowledge of the requirements of the City of Lincoln for the below listed phases and the contract documents (which include Notice, Instructions, this Proposal, Specifications, Contract, and any and all addenda) and all other conditions of the Proposal, agrees to enter into a contract with the City the below listed fees for the performance of this Specification, complete in every respect, in strict accordance with the contract documents at and for fees listed below.

ADDENDA RECEIPT: The receipt of addenda to the specification numbers _____ through _____ are hereby acknowledged. Failure of any submitter to receive any addendum or interpretation of the specifications shall not relieve the submitter from any obligations specified in the request. All addenda shall become part of the final contract document.

1 each Toshiba LQ300 Microwave Fluid \$ _____
Density Meter METER NUMBER 1

Manufacture _____ Model _____

1 each Toshiba LQ300 Microwave Fluid \$ _____
Density Meter METER NUMBER 2

Manufacture _____ Model _____

The undersigned signatory for the bidder represents and warrants that he has full and complete authority to submit this proposal to the City, and to enter into a contract if this proposal is accepted.

RETURN 2 COMPLETE COPIES OF PROPOSAL AND SUPPORTING MATERIAL.

MARK OUTSIDE OF BID ENVELOPE: SEALED BID FOR SPEC. 04-083

COMPANY NAME

BY (Signature)

STREET ADDRESS or P.O. BOX

(Print Name)

CITY, STATE ZIP CODE

(Title)

TELEPHONE No. FAX No.

(Date)

**EMPLOYER'S FEDERAL I.D. NO.
OR SOCIAL SECURITY NUMBER**

ESTIMATED DELIVERY DAYS

E-MAIL ADDRESS

TERMS OF PAYMENT

BIDS MAY BE INSPECTED IN THE PURCHASING DIVISION OFFICES DURING NORMAL BUSINESS HOURS, AFTER TABULATION BY THE PURCHASING AGENT. IF YOU DESIRE A COPY OF THE BID TABULATION TO BE MAILED TO YOU, YOU MUST ENCLOSE A SELF-ADDRESSED STAMPED ENVELOPE WITH YOUR BIDDING DOCUMENTS.

INSTRUCTIONS TO BIDDERS

CITY OF LINCOLN, NEBRASKA

PURCHASING DIVISION

1. BIDDING PROCEDURE

- 1.1 Bidder shall submit two (2) complete sets of the bid documents and all supporting material. All appropriate blanks shall be completed. Any interlineation, alteration or erasure on the specification document shall be initialed by the signer of the bid. Bidders shall not change the proposal form nor make additional stipulations on the specification document. Any amplified or qualifying information shall be on the bidder's letterhead and firmly attached to the specification document.
- 1.2 Bid prices shall be submitted on the Proposal Form included in the bid document.
- 1.3 Bidders may submit a bid on an "all or none" or "lump sum" basis, but should also submit a quotation on an item-by-item basis. Bidding documents shall be clearly marked indicating the kind of proposal being submitted.
- 1.4 Each bid must be legibly printed in ink or by typewriter, include the full name, business address, and telephone number of the bidder; and be signed in ink by the bidder.
- 1.5 A bid by a firm or organization other than a corporation must include the name and address of each member.
- 1.6 A bid by a corporation must be signed in the name of such corporation by a duly authorized official thereof.
- 1.7 Any person signing a bid for a firm, corporation, or other organization must show evidence of his authority so to bind such firm, corporation, or organization.
- 1.8 Bids received after the time and date established for receiving bids will be rejected.

2. BIDDER'S SECURITY

- 2.1 Bid security, as a guarantee of good faith, in the form of a certified check, cashier's check, or bidder's bond, may be required to be submitted with this bid document, as indicated on the Proposal Form.
- 2.2 If alternate bids are submitted, only one bid security will be required, provided the bid security is based on the amount of the highest gross bid.
- 2.3 Such bid security will be returned to the unsuccessful bidders when the award of bid is made.
- 2.4 Bid security will be returned to the successful bidder(s) as follows:
 - 2.4.1 For single order bids with specified quantities: upon the delivery of all equipment or merchandise, and upon final acceptance by the City.
 - 2.4.2 For all other contracts: upon approval by the City of the executed contract and bonds.
- 2.5 City shall have the right to retain the bid security of bidders to whom an award is being considered until either:
 - 2.5.1 A contract has been executed and bonds have been furnished.
 - 2.5.2 The specified time has elapsed so that the bids may be withdrawn.
 - 2.5.3 All bids have been rejected.

- 2.6 Bid security will be forfeited to the City as full liquidated damages, but not as a penalty, for any of the following reasons, as pertains to this specification document:

- 2.6.1 If the bidder fails to deliver the equipment or merchandise in full compliance with the accepted proposal and specifications.
- 2.6.2 If the bidder fails or refuses to enter into a contract on forms provided by the City, and/or if the bidder fails to provide sufficient bonds or insurance within the time period as established in this specification document.

3. EQUAL OPPORTUNITY

- 3.1 Each bidder agrees that it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, ancestry, disability, age, or marital status. Bidder shall fully comply with the provisions of Chapter 11.08 of the Lincoln Municipal Code.
- 3.2 Successful bidder will be required to comply with the provisions of the City's Affirmative Action Policy (Contract Compliance, Sec. 1.16).
- 3.3 The Equal Opportunity Officer will determine compliance or non-compliance with the City's Affirmative Action Policy upon a complete and substantial review of successful bidder's equal opportunity policies, procedures and practices.

4. DATA PRIVACY

- 4.1 Bidder agrees to abide by all applicable State and Federal laws and regulations concerning the handling and disclosure of private and confidential information concerning individuals and corporations as to inventions, copyrights, patents and patent rights.
- 4.2 The bidder agrees to hold the City harmless from any claims resulting from the bidder's unlawful disclosure or use of private or confidential information.

5. BIDDER'S REPRESENTATION

- 5.1 Each bidder by signing and submitting a bid, represents that the bidder has read and understands the specification documents, and the bid has been made in accordance therewith.
- 5.2 Each bidder for services further represents that the bidder is familiar with the local conditions under which the work is to be done and has correlated the observations with the requirements of the bid documents.

6. INDEPENDENT PRICE DETERMINATION

- 6.1 By signing and submitting this bid, the bidder certifies that the prices in this bid have been arrived at independently, without consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder prior to bid opening directly or indirectly to any other bidder or to any competitor; no attempt has been made, or will be made, by the bidder to induce any person or firm to submit, or not to submit, a bid for the purpose of restricting competition.

7. CLARIFICATION OF SPECIFICATION DOCUMENTS

- 7.1 Bidders shall promptly notify the Purchasing Agent of any ambiguity, inconsistency or error which they may discover upon examination of the specification documents.
- 7.2 Bidders desiring clarification or interpretation of the specification documents shall make a written request which must reach the Purchasing Agent at least seven (7) calendar days prior to the date and time for receipt of bids.
- 7.3 Interpretations, corrections and changes made to the specification documents will be made by written addenda.
- 7.4 Oral interpretations or changes to the Specification Documents made in any other manner, will not be binding on the City; and bidders shall not rely upon such interpretations or changes.

8. ADDENDA

- 8.1 Addenda are written instruments issued by the City prior to the date for receipt of bids which modify or interpret the specification document by addition, deletion, clarification or correction.
- 8.2 Addenda will be mailed or delivered to all who are known by the City to have received a complete set of specification documents.
- 8.3 Copies of addenda will be made available for inspection at the office of the Purchasing Agent.
- 8.4 No addendum will be issued later than forty-eight (48) hours prior to the date and time for receipt of bids, except an addendum withdrawing the invitation to bid, or an addendum which includes postponement of the bid.
- 8.5 Bidders shall ascertain prior to submitting their bid that they have received all addenda issued, and they shall acknowledge receipt of addenda on the proposal form.

9. ANTI-LOBBYING PROVISION

- 9.1 During the period between the bid close date and the contract award, bidders, including their agents and representatives, shall not directly discuss or promote their bid with any member of the City Council or City Staff except in the course of City-sponsored inquiries, briefings, interviews, or presentations, unless requested by the City.

10. BRAND NAMES

- 10.1 Wherever in the specifications or proposal form brand names, manufacturer, trade name, or catalog numbers are specified, it is for the purpose of establishing a grade or quality of material only; and the term "or equal" is deemed to follow.
- 10.2 It is the bidder's responsibility to identify any alternate items offered in the bid, and prove to the satisfaction of the City that said item is equal to, or better than, the product specified.
- 10.3 Bids for alternate items shall be stated in the appropriate brand on the proposal form, or if the proposal form does not contain blanks for alternates, bidder MUST attach to the specification documents on Company letterhead a statement identifying the manufacturer and brand name of each proposed alternate, plus a complete description of the alternate items including illustrations, performance test data and any other information necessary for an evaluation. The bidder must indicate any variances by item number from the specification

document no matter how slight. Bidder must fully explain the variances from the specification document, since brochure information may not be sufficient.

- 10.4 If variations are not stated in the proposal, it will be assumed that the item being bid fully complies with the City's specifications.

11. DEMONSTRATIONS/SAMPLES

- 11.1 Bidders shall demonstrate the exact item(s) proposed within seven (7) calendar days from receipt of such request from the City.
- 11.2 Such demonstration can be at the City delivery location or a surrounding community.
- 11.3 If bidder does not have an item in the area, it will be at the bidder's expense to send appropriate City personnel to the nearest location to view and inspect proposed item(s).
- 11.4 If items are small and malleable, and the bidder is proposing an alternate product, the bidder MUST supply a sample of the exact item. Samples will be returned at bidder's expense after receipt by the City of acceptable goods. Bidders must indicate how samples are to be returned.

12. DELIVERY

- 12.1 Each bidder shall state on his proposal form the date upon which he can make delivery of all equipment or merchandise. Time required for delivery is hereby made an essential element of the bid.
- 12.2 The City reserves the right to cancel orders, or any part thereof, without obligation, if delivery is not made within the time(s) specified on the proposal form.
- 12.3 All bids shall be based upon **inside** delivery of the equipment or merchandise F.O.B. the City at the location specified by the City, with all transportation charges paid.

13. WARRANTIES, GUARANTEES AND MAINTENANCE

- 13.1 Copies of the following documents must accompany the bid proposal for all items being bid:
 - 13.1.1 Manufacturer's warranties and/or guarantees.
 - 13.1.2 Bidder's maintenance policies and associated costs.
- 13.2 As a minimum requirement of the City, the bidder will guarantee in writing that any defective components discovered within a one (1) year period after the date of acceptance shall be replaced at no expense to the City. Replacement parts of defective components shall be shipped at no cost to the City. Shipping costs for defective parts required to be returned to the bidder shall be paid by the bidder.
- 13.3 Bidder Warrants and represents to the City that all software/firmware/hardware/equipment/systems developed, distributed, installed or programmed by Bidder pursuant to this Specification and Agreement.
 - 13.3.1 That all date recognition and processing by the software/firmware/hardware/equipment/system will include the four-digit-year format and will correctly recognize and process the date of February 29, and any related data, during Leap years; and
 - 13.3.2 That all date sorting by the software /firmware/hardware/equipment/system that includes a "year category" shall be done based on the four-digit-year format. Upon being notified in writing by the City of the failure of any software/ firmware/

hardware /equipment /systems to comply with this Specification and Agreement, Contractor will, within 60 days and at no cost to the City, replace or correct the non-complying software/ firmware/ hardware/ equipment/ systems with software/firmware/ hardware/equipment/ systems that does comply with this Specification and Agreement.

- 13.3.3 No Disclaimers: The warranties and representations set forth in this section 13.3 shall not be subject to any disclaimer or exclusion of warranties or to any limitations of Licensor's liability under this Specification and Agreement.

14. ACCEPTANCE OF MATERIAL

- 14.1 All components used in the manufacture or construction of materials, supplies and equipment, and all finished materials, shall be new, the latest make/model, of the best quality, and the highest grade workmanship.
- 14.2 Material delivered under this proposal shall remain the property of the bidder until:
- 14.2.1 A physical inspection and actual usage of this material is made and found to be acceptable to the City; and
- 14.2.2 Material is determined to be in full compliance with the specifications and accepted proposal.
- 14.3 In the event the delivered material is found to be defective or does not conform to the specification documents and accepted proposal, then the City reserves the right to cancel the order upon written notice to the bidder and return materials to the bidder at bidder's expense.
- 14.4 Successful bidder shall be required to furnish title to the material, free and clear of all liens and encumbrances, issued in the name of the City of Lincoln, Nebraska, as required by the specification documents or purchase orders.
- 14.5 Selling dealer's advertising decals, stickers or other signs shall not be affixed to equipment. Vehicle mud flaps shall be installed blank side out with no advertisements. Manufacturer's standard production forgings, stampings, nameplates and logos are acceptable.

15. BID EVALUATION AND AWARD

- 15.1 The signed bid proposal shall be considered an offer on the part of the bidder. Such offer shall be deemed accepted upon issuance by the City of purchase orders, contract award notifications, or other contract documents appropriate to the work.
- 15.2 No bid shall be modified or withdrawn for a period of ninety (90) calendar days after the time and date established for receiving bids, and each bidder so agrees in submitting the bid.
- 15.3 In case of a discrepancy between the unit prices and their extensions, the unit prices shall govern.
- 15.4 The bid will be awarded to the lowest responsive, responsible bidder whose proposal will be most advantageous to the City, and as the City deems will best serve their requirements.
- 15.5 The City reserves the right to accept or reject any or all bids; to request rebids; to award bids item-by-item, by groups, or "lump sum"; to waive irregularities and technicalities in bids; such as shall best serve the requirements and interests of the City.

16. INDEMNIFICATION

- 16.1 The bidder shall indemnify and hold harmless the City, its members, its officers and employees from and against all claims, damages, losses, and expenses, including, but not limited to attorney's fees arising out of or resulting from the performance of the contract, provided that any such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property other than goods, materials and equipment furnished under this contract) including the loss or use resulting therefrom; is caused in whole or part by any negligent act or omission of the bidder, any subcontractor, or anyone directly or indirectly employed by any one of them or anyone for whose acts made by any of them may be liable, regardless of whether or not it is caused by a party indemnified hereunder.
- 16.2 In any and all claims against the City or any of its members, officers or employees by an employee of the bidder, any subcontractor, anyone directly or indirectly employed by any of them or by anyone for whose acts made by any of them may be liable, the indemnification obligation under paragraph 16.1 shall not be limited in any way by any limitation of the amount or type of damages, compensation or benefits payable by or for the bidder or any subcontractor under worker's or workmen's compensation acts, disability benefit acts or other employee benefit acts.

17. TERMS OF PAYMENT

- 17.1 Unless other specification provisions state otherwise, payment in full will be made by the City within thirty (30) calendar days after all labor has been performed and all equipment or other merchandise has been delivered, and all such labor and equipment and other materials have met all contract specifications.

18. LAWS

- 18.1 The Laws of the State of Nebraska shall govern the rights, obligations, and remedies of the Parties under this proposal and any agreement reached as a result of this process.

**Specifications
For
Microwave Fluid Density Meter**

1. Acceptable Manufacturer

1.1 Toshiba LQ300

2. General

2.1 Supplier shall furnish two (2) Microwave Fluid Density Meter (detector / converter integral type) for measuring the density of municipal primary and thickened wastewater process sludges as per the requirements and specifications described herein.

3. Process Conditions and Operating Requirements

3.1 Meter Number 1

3.1.1	Line Size and Flange Type:	Size <u>6 inch</u>	Flange Type <u>125# ANSI</u>
3.1.2	Type and Composition of Process Piping:	<u>Ductile Iron</u>	
3.1.3	Horizontal Application/Configuration		
3.1.4	Fluid to be Measured is Municipal Primary Sludge		
3.1.5	Average Density to be Measured:	<u>3.5 % TS (Total Solids)</u>	
3.1.6	Calibration Range of Process Liquid:	<u>0 to 6 %</u>	
3.1.7	Flow Rate of Process: (GPM)	Normal <u>180</u>	Max. <u>250</u> Min. <u>80</u>
3.1.8	Process Temperature: (°F)	Normal <u>60</u>	Max. <u>90</u> Min. <u>45</u>
3.1.9	Process Conductivity:	Normal <u>1200</u>	Max. <u>1500</u> Min. <u>750</u>
3.1.10	Process pH:	Normal <u>7.1</u>	Max. <u>7.3</u> Min. <u>6.8</u>
3.1.11	Process Pressure:	Normal <u>10</u>	Max. <u>30</u> Min. <u>0</u>
3.1.12	Meter Ambient Temperature: (F)	Normal <u>65</u>	Max. <u>100</u> Min. <u>45</u>
3.1.13	Power Supply:	<u>120 VAC</u>	<u>60Hz</u>

3.2 Meter Number 2

3.2.1	Line Size and Flange Type:	Size <u>6 inch</u>	Flange Type <u>125# ANSI</u>
3.2.2	Type and Composition of Process Piping:	<u>Ductile Iron</u>	
3.2.3	Horizontal Application/Configuration		
3.2.4	Fluid to be Measured is Municipal Digester Feed (Thickened Secondary & Primary) Sludge.		
3.2.5	Average Density to be Measured:	<u>4.5 % TS (Total Solids)</u>	
3.2.6	Calibration Range of Process Liquid:	<u>3 to 6 %</u>	
3.2.7	Flow Rate of Process: (GPM)	Normal <u>150</u>	Max. <u>300</u> Min. <u>100</u>
3.2.8	Process Temperature: (F)	Normal <u>60</u>	Max. <u>90</u> Min. <u>45</u>
3.2.9	Process Conductivity:	Normal <u>1200</u>	Max. <u>1500</u> Min. <u>750</u>
3.2.10	Process pH:	Normal <u>7.1</u>	Max. <u>7.3</u> Min. <u>6.8</u>
3.2.11	Process Pressure:	Normal <u>10</u>	Max. <u>30</u> Min. <u>0</u>
3.2.12	Meter Ambient Temperature: (F)	Normal <u>65</u>	Max. <u>100</u> Min. <u>45</u>
3.2.13	Power Supply:	<u>120 VAC</u>	<u>60Hz</u>

4. Equipment and Performance Specifications

4.1 (See Attached)

4.2 Supplier is required to note any exceptions to the specifications.

4.3 **Meters shall be Teflon lined.**

5. Miscellaneous

5.1 Warranty

5.1.1 Supplier shall warrant the specified equipment from defects in materials and workmanship for a period of (1) one year from date of installation or 18 months from date of purchase.

5.2 Operation and Maintenance Information

5.2.1 Three (3) sets of O&M manuals specific to the model supplied shall accompany delivery of the equipment.

5.2.2 O&M manual information shall consist of general operating instruction, recommended spare parts, recommended maintenance, trouble shooting guides, and exploded part assemblies.

5.3 Start -up, Testing and Training

5.3.1 The supplier of the density meter shall provide a qualified, experienced factory trained technician to verify that the meter and associated components have been installed properly and to provide operation and maintenance training relating to the equipment.

6. Delivery Information and Contact

6.1 Contact Mr. Steve Crisler, telephone number 402-441-7966 with any technical questions regarding this request.

6.2 Shipping address shall be Lincoln Wastewater System, Theresa Street Wastewater Treatment Facility, 2400 Theresa Street, Lincoln, NE. 68521

Introduction

The LQ300 density (consistency) meter uses microwave phase difference method to determine concentrations of solids in the material to be measured flowing through pipes. The LQ300 can perform a stable density (consistency) measurement in various fields because this method is not affected by flow velocity and is not easily affected by contaminants or bubbles. As the LQ300 has no moving parts, it is reliable and maintenance is easy.

Since the output of the LQ300 is theoretically linear, it can be applied to a wide range of density (consistency) measurements from low to high density (consistency) and it is easy to change the measurement range. LQ300 complies with the EMC directive 89/336/EEC and the low voltage 93/68/EEC. The LQ300 can be operated from its operation panel and also it can be operated from remote places using the optional AF100 hand-held terminal with HART protocol.

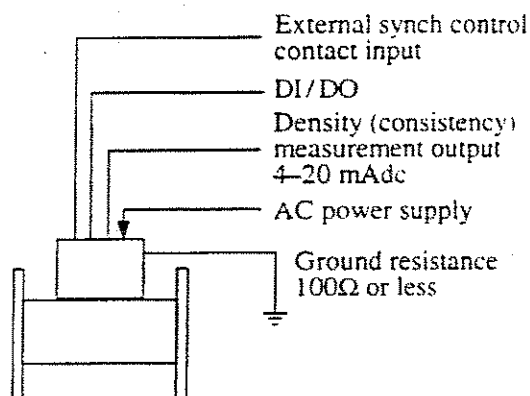


Figure 1. LQ300 Configuration Diagram

■ Standard Configuration

- Density (consistency) Meter 1 set
(Detector / Converter integral type)
- Accessories 1 set (see Table 1 below.)

Table 1. Standard Accessories

Items	Specifications	Quantity
Fuse	1A (M), 250V (glass tube, 5.2 dia. × 20mm)	2
Document	Instruction manual	1

Specifications

■ Overall Specifications

Measurement method: Microwave phase difference method

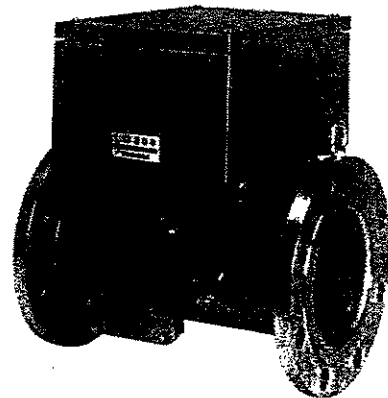


Figure 2. LQ300 Density (consistency) Meter

Measurement range:

- Span: 1 to 50% TS
 - Lower limit setting range: 0 to 49% TS
 - Upper limit setting range: 1 to 50% TS
- Upper and lower ranges can be set in 0.1% TS increments.

Notes:

- (1) TS: Total Solids
Span = Upper range – Lower range
- (2) The material to be measured must be fluid and be filled evenly with no voids.

Repeatability and Linearity:

- ±2% FS for the fullscale value of 2% TS or greater.
- ±4% FS for the fullscale value of less than 2% TS.

Electrical Resolution: 0.001% TS

Density (consistency) determination resolution for sample reagent: 0.05 %TS

Note: The density (consistency) determination resolution stated above is defined due to manufacturing limitations to make reagents with stable distribution and a minimum difference of fluid density (consistency).

Environmental conditions

- Temperature: 0 to 50 °C (32 to 122 °F)
- Humidity: 5 to 85% RH (no condensation)

Structure: IP65

Note: Outdoor installation is possible. However, provide a sunshade for the converter section if direct sunlight is unavoidable.

Weight: Refer to Outline Dimensions (Table 2).

■ Detector Specifications

Meter size: 80 mm (3"), 100 mm (4"), 150 mm (6"), 200 mm (8"), 250 mm (10"), and 300 mm (12")

Flange standard and maximum working pressure:

Flange standard	Maximum working pressure
ANSI Class 150	1 MPa (150 psi)
BS 10	1 MPa (10 bar)
DIN 10	1 MPa (10 bar)
JIS 10K	1 MPa (10 kgf/cm ²)

Fluid temperature:

Standard specification:

0 to 50 °C (32 to 122 °F) (no freezing)

High-temperature specification (option):

0 to 90 °C (32 to 194 °F) (no freezing)

Allowable fluid conductivity:

Meter size	Fluid conductivity
80 mm (3")	12 mS/cm maximum
100 mm (4")	10 mS/cm maximum
150 mm (6")	7 mS/cm maximum
200 mm (8")	5 mS/cm maximum
250 mm (10")	3 mS/cm maximum
300 mm (12")	3 mS/cm maximum

NOTE:

Do not use the LQ300 for applications where liquids containing highly conductive particles are used. Liquids containing particles such as active carbon or metal particles are highly conductive and may interfere with density (consistency) measurement.

Wetted materials:

Name	Standard spec. 0 to 50 °C (32 to 122 °F)	High-temp. spec. 0 to 90 °C (32 to 194 °F)
Main pipe	316 stainless steel	
Temperature detector sheath	316 stainless steel	
Applicator window	Vinyl chloride	Polysulfone
Applicator window sealant	Fluorocarbon rubber (Viton)	

Note: Do not use the LQ300 for applications where harmful liquids are used that cause corrosion, deterioration, or changes in quality for the wetted materials.

Applicator: Serves as an antenna to send and receive microwave signals, one set provided.

Temperature detector: RTD (Pt100)

Fitting: Direct fitting to vertical or horizontal piping.

Painting: Ground color (stainless steel)

■ Converter Specifications

Output signals

- **Density (consistency) measurement output:**

4–20 mA dc (load resistance 750Ω maximum, isolated output.)

- **Density (consistency) fault or Maintenance**

signal: 125 V ac, 0.1 A (resistive load) solidstate contact; opens when an error occurs in the converter or when the LQ300 is in the setting change mode, otherwise the contact remains closed.

Communication signal: Digital signal is superimposed on 4–20 mA dc current signal (conforming to HART protocol*).

Load resistance: 240 to 750Ω

Load capacity: 0.25 μF maximum

- * HART (Highway Addressable Remote Transducer) protocol is a communications protocol for industrial sensors recommended by HCF (HART Communication Foundation).

Note: The optional AF100 hand-held terminal can be used to operate the LQ300 from remote places by connecting the AF100's probe lead between the LQ300's 4–20 mA dc output signal lines.

Input signals

- **Externally synchronized input signal:** One dry "make" contact; contact capacity of 24 V dc, 1 A or more is required. This contact signal can be used to start or stop density (consistency) measurement in synchronization with an external contact, such as the contacts on a pump. The measurement starts or stops as follows:

Contact closed: Starts density (consistency) measurement.

Contact open: Stops density (consistency) measurement.

- **Density multiplier switching signal:**

Two voltage signals described below are required:

Input voltage: H level 20 – 30 V dc
L level 2 V dc or less

Input resistance: Approx. 3 kΩ

One of four span calibration settings can be selected using these two signals. Measurements by selecting one of four kinds of liquids (with different compositions or with different mixing rates) can be performed using this function.

Update period for density (consistency) measurement output and display: Approx. 1 second

Moving average: The moving average of 1 to 99 measurements taken at a 1 second interval can be output. This output can be used to control density (consistency) value etc. for which averaged density (consistency) value is usually required.

Change-rate limit:

Allowable rate of change limit: 0.00 to 9.99% TS

Number of times: 0 to 99

This function is used to restrict sudden changes in output by rejecting values caused by sudden changes in density (consistency) or entrapped air in the fluid etc. The change-rate limit condition can be set using the allowable rate of change limit value and the number of times this condition occurs.

Additives Correction function:

Available for up to 10 kinds of mixed/blended liquids. Sensitivity compensation can be set using registered parameters depending on the type and the mixing rate of liquids.

Arrester: Arresters are installed in the LQ300 current output (4–20 mA dc) and AC power lines.

Display: LED density (consistency) display as standard. 7-segment, 4-character LED (00.00 to 99.99 %TS) with window frame is provided.

Operation Panel (inside the converter):

Used to check data or to change various settings.

Operation switches: 5 switches

Display: 4-line, 20-character LCD (dot-matrix)

Password function:

This function is used to limit access to setting values that affect measured values by means of a password.

Power supply:

100 to 240 V ac, 50/60 Hz

(Allowable voltage: 85 to 264 V ac)

Power consumption: Approximately 50 VA

Housing material: Steel plate

Coating: Polyurethane